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Editorial

In-situ leaching of uranium deposits

Dr Marat Abzalov of the Editorial Board has drawn together five papers for a special issue on uranium deposits that are amenable to *in-situ* leaching. Such deposits are usually found in sandstone sequences and are difficult to mine beneath the water table by conventional underground techniques. Part of this difficulty stems from the permeable and unconsolidated nature of the host sediments but the same characteristics mean that uranium can be extracted by in-situ leaching using either acid or alkaline solutions. Both the formation of these deposits and the extraction from pitchblende and coffinite rely on uranium chemistry, especially the solubility of the U^{6+} form and relative insolubility of the U^{4+} form.

The special issue starts with a review of this group of uranium occurrences and we find that they comprise over a quarter of all uranium resources. They occur in a number of non-marine sedimentary basin settings in which oxidising conditions facilitate uranium transport and organic-rich reducing sites lead to uranium precipitation. Bedding and faults play a role in the distribution of uranium; the well-known roll-front deposits made famous by the Wyoming and Texas states deposits is just one of several types that have been successfully mined. Today, the major resources of in-situ leachable uranium are found in Kazakhstan, and to a lesser extent, USA and Australia.

The second paper by Russell Penney provides an overview of the sandstone-hosted uranium deposits of Australia where two deposits are currently producing, but much undeveloped uranium mineralisation is already defined especially in South Australia.

Marat Abzalov and Oscar Paulson provide an overview of the important uranium deposits of western USA, and especially Wyoming. These examples highlight many of the classic aspects of the group, e.g. older uraniferous granite source, weakly lithified sandstone, fault and bedding control on fluid migration, and uranium deposition adjacent to carbonaceous matter.

Didier Renard and Hélène Beucher provide some three-dimensional modelling of the uranium rolls and the processes that may lead to roll front deposits. This approach includes stochastic modelling of the lithofacies which can be integrated with chemical and fluid flow data. Although the approach initially was developed for estimation of resources of the geometrically complex type of the uranium rolls it may also offer new insights to explorers trying to better understand their uranium distribution.

Russell Penney, Caleb Ames, David Quinn and Alex Ross describe Prompt Fission Neutron technology. The method addresses the difficulty and errors in conventional gamma logging where daughter products are measured as a proxy for uranium but allowance cannot be made for separate migration and redistribution of uranium and its daughter products in groundwaters. PFN technology measures the uranium directly by neutron activation, is fast and measures a relatively large volume of rock.

Neil Phillips Editor

Marat Abzalov Guest Editor

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